NGI/CE/01

Test Two-Way Satellite Internet Communications For the NOAA Profiler Network

FY 2003 Proposal to the NOAA HPCC Program

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Proposal Theme: **Disaster Planning, Mitigation, Response and Recovery**

Funding Summary: FY 2003 $ 24,520

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Test Two-Way Satellite Internet Communications

For the NOAA Profiler Network

Proposal for FY 2003 HPCC Funding

Prepared by: Bobby R. Kelley

Executive Summary:

This project is proposed to test two-way satellite-based communications via internet for data acquisition and system control for the NOAA Profiler Network. Current and emerging two-way satellite-based technology has the potential to provide significantly faster access for data acquisition and system control via internet for the remote NOAA Profiler Network sites. Testing is necessary to determine the reliability of two-way satellite-based communications that is required for 7x24x365 operation of the NOAA Profiler Network. Successful outcome can reduce recurring annual data communications costs by 50% or better, saving at least $60,000 annually.

Problem Statement:

Primary two-way communication for NOAA Profiler Network sites is currently accomplished over land-based telecommunications. Quite high reliability has been established over the years with the service provider, but the costs are subject to significant increase. This is due in part to service providers increasing rates. Other factors that will increase communications cost are anticipated expansion of the NOAA Profiler Network and the potential for sharing site space and communications capabilities by adding more instruments at profiler sites to support other projects. To expand the profiler network, the cost of installing landlines is quite expensive in the remote locations suitable for new profilers. Adding instruments for other projects and experiments will likely result in a requirement for more bandwidth, and this will also increase the cost of land-based telecommunications. Meanwhile, two-way satellite-based communications is readily available that has the potential of providing plenty of bandwidth to meet the foreseeable needs and more at no more than half the cost of land-based telecommunications. Testing for reliability at varying geographic locations and in varying weather conditions is necessary.

While weather research and forecasting are the primary focus of the NOAA Profiler Network, this proposal fits the NOAA HPCC program objectives by supporting NOAA and its customers in responding to natural and man-made disasters. The NOAA Profiler Network provides extremely valuable information to weather forecasters for situations such as rapidly developing storm systems and forest fire fighting. Profiler data is also used to provide information in the event of chemical or nuclear accidents or terrorist attacks.

Proposed Solution:

The proposed funding will be used to obtain equipment, one year of two-way satellite communications services, and one year of technical support from providers for four test sites plus the central facility. Testing will be conducted continuously for 10 to 12 months in parallel with existing land-based telecommunications services. The probable sites for testing will include Platteville, Colorado; Hillsboro, Kansas; Wood Lake, Minnesota; and Winnfield, Louisianna. The Platteville site provides close proximity to the Profiler Program Office in Boulder, Colorado, enabling frequent travel to the remote site for initial installation, configuration and testing. With lessons learned from the Platteville installation and testing, satellite communications can be implemented at the Hillsboro site. Hillsboro is a likely test site due to it being in an area of highly volatile weather conditions throughout the year. The Wood Lake site is a good choice for testing reliability at a location where winter snow and ice conditions are frequently significant. The Winnfield site is a good choice for reliability testing at a location where summer heat, humidity and rainfall are usually significant.

FSL/DD government and contract personnel will do the work required to support this test project at no additional personnel costs. No funds are requested for salaries or travel.

Major activities being considered in this project:

- Test sites will be selected;
- Multiple service providers will be selected (preferably a minimum of three)
- Install equipment at the central facility and the initial test site and start testing
- Using lessons learned from initial test site, install three more test sites one by one
    - ✓ Incorporate lessons learned from each installation in the subsequent installation
- Evaluate reliability of two-way satellite communications over 10 to 12 months of operation
- Determine acceptability of two-way satellite communications for an operational network

Analysis:

Continuing to operate the NOAA Profiler Network on land-based telecommunications as a primary means of data acquisition and system control is becoming less cost effective. Maintaining high reliability for NOAA Profiler Network data acquisition and system control is imperative. Reasonably long-term (10 to 12 months) testing must be accomplished to determine the capabilities and reliability of a new communications means as weather seasons change. This approach is proposed to determine whether or not current two-way satellite communications can provide the required effectiveness and reliability. The desired outcome is an effective and highly reliable communications means that provides improved bandwidth and significantly reduces annual recurring costs by at least 50% (at least $60,000 annually) to operate the NOAA Profiler Network. An additional benefit would be enabling sharing of profiler communications with other projects and experiments. Two-way satallite communications bandwidth availability is expected to be capable of supporting other instrumentation at NOAA Profiler Network sites, and this can reduce communications costs for other projects and experiments.

Performance Measures:

- Ease of installation, configuration and maintenance of vendor's equipment
- Ease of integration with NOAA Profiler Network operations
- Effectiveness of communications bandwidth
  - ✓ Dependability and responsiveness of two-way communication between the central facility and remote sites
  - ✓ Not less than 56Kbps up-link and down-link at any time
- Two-way communications reliability
  - ✓ Not less than 98% uptime on a 7 days x 24 hours basis

Milestones

- Month 01 -- Install/configure/test central site and one remote site
- Month 02 -- Install/configure/test three additional remote sites
- Months 1-12 -- Effectiveness and reliability testing
- Month 12 -- Determination report on effectiveness and reliability

Deliverables

- Report -- Determination of the effectiveness and reliability of two-way satellite-based communications for the NOAA Profiler Network and other projects
- NOAA Profiler Network central site satellite communications base
- NOAA Profiler Network remote site satellite communications for four sites